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not extraordinary. Weismann, having placed the larva of *Musca vomitoria* under water, has seen that the tracheal system remains filled with air at the expiration of several hours. The respiration of internal larvæ is then very normal, the tracheal system having undergone slight modifications. Upon leaving the host the spiracles open and the air enters through them.

(c) *Molts*.—He has observed a molt in the young internal larva of *Apanteles glomeratus*. The mandibles and the larval cuticle are shed. In certain of the young larvæ, one sees, in fact, after the molt of the body, the two mandibles of an earlier stage. The molt is made like that of the pupa, the old skin slipping from before towards the anal end of the body. The larva sheds this old skin into the open space behind it.

Such are the facts concerning the mode of life of internal parasites in their hosts. There is really nothing mysterious in this mode of life. The functions are accomplished normally by means of slight modifications which it would have been easy to foresee.

M. Seurat is heartily to be congratulated on this excellent piece of work, setting at rest, as it does, so many mooted points. It is interesting to note that he has not made any observations at all parallel to those of Marchal, who states that a single egg of *Encyrtus* laid in the egg of *Hyponomeuta* dissociates itself into a great number of embryos which develop into individual larvæ in the larva of the host.

L. O. HOWARD.

*The Structure and Life-History of the Harlequin Fly (Chironomus)*. By L. C. MIALl, F.R.S., and A. R. HAMMOND, F.L.S. Oxford, Clarendon Press. 1900. Pp. 191; figs. 129.

Professor Miall has gained an enviable reputation as a student of the life history and structure of a number of common insects, and in the course of this work he has discovered many novel and important facts. His little book entitled 'The Structure and Life-History of the Cockroach,' done in collaboration with Alfred Denny, is a model treatise on Orthopteran insect anatomy and his treatise on 'The Natural History of Aquatic Insects' is one of the most valuable and readable entomological books

which has been published of late years. In the present volume the authors have given a very careful study of the development of the Chironomidæ, some of the species of which have long been favorite objects with histologists and embryologists. They have a very special biological interest in their various stages and it is thought that their inclusion in ordinary teaching courses will be desirable and will be facilitated by the present volume. *Chironomus* larvæ are very abundant and are found in pools and streams and at the bottom of deep fresh water lakes, Professor S. I. Smith having dredged them from the bottom of Lake Superior at a depth of nearly 1,000 feet. They have also been found in salt water and Packard has studied a species abundant at low water mark in Salem Harbor.

The larvæ inhabit tubes which they make of silk and mud or aquatic vegetation, and certain of the larvæ possess only a rudimentary tracheal system which appears late in the larval stage. No insect known to the writers has more completely departed from the habits and structure of an air-breathing animal, yet even here is found proof of descent from a terrestrial insect with branching air tubes. This remarkable modification is necessary from the fact that certain of the larvæ live at great depths where it is impossible for them to rise to the surface. This absence of a tracheal system does away with the possibility of breathing by tracheal gills which is the commonest respiratory method with aquatic insects and necessitates the presence of blood gills, so that respiration is accomplished practically as with fishes and larval *Batrachea*.

The whole internal anatomy of all stages is carefully described, with excellent figures, and this is done in a masterly and comparative way and includes a study of the embryonic development. An appendix is devoted to the methods of anatomical and histological investigation.

An important point which the authors bear in mind and which Professor Miall has frequently advanced is that they desire by such work to incite the members of naturalist clubs and other non-academic biologists to take up the study of life histories. Such work in the past has yielded facts of the greatest biologic importance, and yet to-day the field is largely

neglected. The great nature-study movement which is making such rapid strides in this country would be encouraged and assisted by many more such books as this if we had the investigators and writers able to make such careful studies and to put them in print in such admirable shape.

L. O. HOWARD.

*Transactions of the American Society of Mechanical Engineers.* Vol. XXI., New York Meeting, 1899, Cincinnati Meeting, 1900. New York; published by the Society, 1900. Pp. 1778; 8vo., 372 ill.; 33 papers, reports of committees, etc. Printed by J. J. Little & Co.

This large and handsome volume represents the work of the American Society of Mechanical Engineers, so far as it can be exhibited in type, for a single official year. The organization was effected in 1880, after many unsuccessful attempts had been made by other less influential or less tactful members of the profession, and started off with a small number of members selected from among the leaders of the profession of engineering. It now has a total membership of 2,064, including 113 foreign members. The officers are a president, six vice-presidents, nine managers, a treasurer and a secretary, while its governing body, the Council, includes the officers, and the past-presidents of the Society are 'honorary councillors' holding their positions for life or during their continued connection with the Society. Two conventions are held each year, one in New York, at headquarters, the other at usually, some large city in the central or western portion of the country. All persons engaged in engineering are eligible to membership, under certain restrictions and in classes, as members, honorary members, juniors, associates; the Council making a first revision of the list and recommending to the Society those whose credentials are considered satisfactory. The headquarters of the Society are at its own house, No 12 West 31st St., New York City, formerly that of the Academy of Medicine.

The published papers and their discussions cover a very wide range of topics and are supplemented by a series of 'topical discussions' in answer to queries suggested by members and

sent out by the Council. These volumes are rich in valuable fact and data thus derived.

The papers are often of considerable length and their value is often proportional to their volume. Thus the report of the Committee of a Standard Method of Steam-boiler Trials, 78 pages, is followed by a discussion occupying 27 pages; Admiral Melville gives 17 pages to 'Engineering in the U. S. Navy'; Thurston on 'The Steam-Engine at the Close of the XIXth Century,' occupies 61 pages; Dr. Eddy on 'Entropy,' submits 17 pages; Laird on a 'Remarkable Steam Pumping Engine Trial,' 24 pages; Goss on a similar work, 39 pages; Robertson on the 'Test of a 125-horse-power Gas-Engine,' covers 43 pages; Herschman on 'The Heavy Automobile,' 30 pages; Kerr's admirable paper on the 'South Terminal Station, Boston,' occupies 27 pages; Professors Cooley and Wagner on a 'Nordbury Engine,' admirably full, 96 pages, while the most generally interesting paper of the volume, apparently, that of Professor Higgins on 'The Education of Machinists, Foremen and Engineers,' 19 pages, is discussed in 86 pages and is supplemented at the second meeting of the volume by another paper, occupying 40 pages, in which the author closes a most extraordinarily interesting and instructive discussion, perhaps the most important and instructive respecting technical education ever yet put in type.

A very large proportion of the papers are devoted to accounts of investigations of the performance of heat-engines and of machinery of interesting, and commonly of novel, character and to descriptions of the processes of experimental research and resultant data. The file of the twenty years past is extraordinarily rich in this, to the engineer, most superlatively valuable material. A large part naturally comes from the technical schools and colleges; but it is always practically valuable and often, if not invariably, conveys a form of knowledge that the practitioner most desires. The fact, however, that the 'practical man' cannot be induced to present oftener, and in good form, the outcome of his experience and the results of his endeavors to secure improved design, to invent new devices and processes,